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(54) TONER, TWO-COMPONENT DEVELOPER AND METHOD OF FORMING IMAGE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide toner, a two-component developer and a method of forming an image such that excellent fixing property is obtained even in a thick paper sheet in which fixing load is hardly transmitted, that contamination of a heat roll is prevented for long-term use even in a device having no cleaning mechanism for the heat roller.

SOLUTION: In the toner containing at least a binder resin, coloring agent and waxes, the waxes consist of fatty acid esters exhibiting the endothermic peak in 60 to 105°C region measured by DSC, a low melting point hydrocarbon wax having the endothermic peak in 60 to 105°C region measured by DSC and a high melting point hydrocarbon wax having the endothermic peak in 120 to 160°C measured by DSC.

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## CLAIMS

### [Claim(s)]

[Claim 1] In the toner which contains a binding resin, a coloring agent, and waxes at least The fatty acid ester which has the endothermic peak at which these waxes are measured by DSC in an at least 60-105-degree C field The toner characterized by the bird clapper from the high-melting point hydrocarbon system wax which has the endothermic peak measured by the low melting point hydrocarbon system wax which has the endothermic peak measured by DSC in an at least 60-105-degree C field, and DSC in an at least 120-160-degree C field.

[Claim 2] The toner according to claim 1 with which the diameter of an average wax domain of the waxes of the aforementioned toner is 0.3-1 micrometer, and a wax domain 2.0 micrometers or more is characterized by one-piece being less than several % by the diameter of a minor axis.

[Claim 3] The toner according to claim 1 or 2 characterized by carrying out [ fatty acid ester ] 3-6 mass section content of 3 - 9 mass section and the aforementioned high-melting point hydrocarbon system wax for 1 - 6 mass section and the aforementioned low melting point hydrocarbon system wax to the aforementioned toner 100 mass section.

[Claim 4] A toner given in any 1 term of the claims 1-3 characterized by the sum of a content with the aforementioned fatty acid ester and a high-melting point hydrocarbon system wax being 4 - 10 mass section to the aforementioned toner 100 mass section.

[Claim 5] A toner given in any 1 term of the claims 1-4 to which 1-6 mass section content is carried out, and a styrene-olefin block copolymer is characterized by the bird clapper into the aforementioned binding resin 100 mass section.

[Claim 6] A toner given in any 1 term of the claims 1-5 characterized by the weight average molecular weight of the aforementioned styrene-olefin block copolymer being 5000-500,000.

[Claim 7] In the two component developer which consists of a binding resin, a coloring agent, a toner containing waxes, and a carrier at least The fatty acid ester which has the endothermic peak at which these waxes are measured by DSC in an at least 60-105-degree C field The endothermic peak measured by the low melting point hydrocarbon system wax which has the endothermic peak measured by DSC in an at least 60-105-degree C field, and DSC consists of a high-melting point hydrocarbon system wax in an at least 120-160-degree C field. And the two component developer characterized by this carrier being a silicone resin covering carrier.

[Claim 8] The two component developer according to claim 7 characterized by the aforementioned carrier being five to core exposure 30 area %.

[Claim 9] The heating roller which connotes the heating component which the electrostatic latent image formed on the photo conductor was developed [ heating component ] with the binding resin, the coloring agent, and the developer containing waxes at least, the toner picture was formed [ heating component ] on the photo conductor, and this toner picture was imprinted [ heating component ] on the image formation base material, and had the toner picture on this image formation base material placed in a fixed position. The pressurization roller by which opposite arrangement was carried out. Are the image formation method equipped with the above, and this heating roller was covered with the fluororesin with

a thickness of 5-300 micrometers. Surface roughness Ra is the heating roller which is 0.1-1.0 micrometers, and this pressurization roller was covered with the fluororesin with a thickness of 10-500 micrometers. The fatty acid ester which has the endothermic peak at which it is the pressure roll whose surface roughness Ra is 0.2-2.0 micrometers, and these waxes are measured by DSC in an at least 60-105-degree C field It is characterized by using the toner with which the endothermic peak measured by the low melting point hydrocarbon system wax which has the endothermic peak measured by DSC in an at least 60-105-degree C field, and DSC consists of a high-melting point hydrocarbon system wax in an at least 120-160-degree C field.

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## DETAILED DESCRIPTION

### [Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the image formation method using the two component developer and this toner using the toner and this toner for developing the electrostatic-charge image in electrophotography, electrostatic recording, electrostatic printing, etc.

[0002]

[Description of the Prior Art] In electrophotography, the most general fixing method is a heat mechanical control by roller. Printing speed tends to increase increasingly with increase of the amount of information to process. The level of aspiration of a fixing performance to pasteboard is high by the spread of the finishers which \*\*\*\* after printing and bind a book in the high-speed copying machine and high speed printer by which process speed exceeds 380 mm/s. Therefore, it can be established also in the pasteboard with which a fixing load cannot be transmitted easily, and a fixing image has a mechanical strength and development of the toner which does not produce offset generating is desired strongly. Moreover, although development of fixing equipment without heat roller cleaning systems, such as a web method and a brush mechanical control by roller, is progressing for the miniaturization of equipment, the performance is not yet enough. Especially, at the time of pasteboard use, the adhesive fall of a toner and a transfer paper is remarkable, a toner adheres to a heat roller in long-term use, after accumulating to the part in contact with heat rollers, such as a separation presser foot stitch tongue and a thermo sensor, the adhering toner re-imprints to a transfer paper, and a poor picture arises.

[0003] For example, the technology aiming at improvement in the slipping fixing nature by the wax is indicated by each official report, such as the patent official report No. 2889355, JP,8-334920,A, and JP,9-96920,A. However, in these toners, the problem of heat roller contamination is not solvable in the equipment which eliminated the heat roller cleaning system at the time of long-term use. Therefore, it is established in the amount of low fever, fixing nature is excellent also in the pasteboard with which a fixing load cannot be transmitted easily, and development of the toner which heat roller contamination does not generate in equipment without a heat roller cleaning system at the time of long-term use is desired strongly.

[0004]

[Problem(s) to be Solved by the Invention] The purpose of this invention is to offer the two component developer and the image formation method using the toner and this toner in which fixing nature is excellent also in the pasteboard with which there is no generating of heat roller contamination also in the equipment which there is no generating of offset also in any of low-temperature fixing or elevated-temperature fixing, therefore does not have a cleaning system again at the time of long-term use, and a fixing load cannot be transmitted easily.

[0005]

[Means for Solving the Problem] Compatibility is high to a binding resin and this binding resin fat in a toner as a result of [, such as this invention person, ] wholeheartedly examination. The fatty acid ester which has the endothermic peak measured by DSC (differential scanning calorimetry) in an at least 60-

105-degree C field It is distributed content (hereafter) to the shape of \*\*\*\* about the high-melting point hydrocarbon system wax which has the endothermic peak measured by the low melting point hydrocarbon system wax which has the endothermic peak measured by DSC in an at least 60-105-degree C field, and DSC in an at least 120-160-degree C field. The toner with which these waxes made it precise and distributed content was uniformly carried out by also calling it a domain state and carrying out is obtained. Therefore, it migrates to an elevated-temperature field from the low-temperature field of fixing conditions, and an offset phenomenon was not produced, therefore heat roller contamination was not produced again, and it continues at a long period of time, and came to find out the toner in which good image formation is possible. By furthermore, the thing for which the low melting point wax in which it exists in the interface of a transfer paper and a toner layer, and the rate of fixing is reduced is controlled in the suitable range The fixing nature which was excellent also to the pasteboard of paper-of-fine-quality 200 g/m<sup>2</sup> can be demonstrated. Consequently, the design of the copying machine and printer which do not have a heat roller cleaning system in a fixing system is attained. When a heat roller cleaning system and an oil application mechanism especially make the above-mentioned mechanism unnecessary conventionally also in indispensable high-speed copying machine and high speed printer beyond process speed 380 mm/s has shown that the miniaturization of equipment can be attained.

[0006] The purpose of the above-mentioned this invention is attained by the following composition.

1. In Toner Which Contains Binding Resin, Coloring Agent, and Waxes at Least The fatty acid ester which has the endothermic peak at which these waxes are measured by DSC in an at least 60-105-degree C field The toner characterized by the bird clapper from the high-melting point hydrocarbon system wax which has the endothermic peak measured by the low melting point hydrocarbon system wax which has the endothermic peak measured by DSC in an at least 60-105-degree C field, and DSC in an at least 120-160-degree C field.

[0007] 2. Toner given in the above 1 with which diameter of average wax domain of waxes of aforementioned toner is 0.3-1 micrometer, and wax domain 2.0 micrometers or more is characterized by one-piece being less than several % by diameter of minor axis.

[0008] 3. Toner the above 1 characterized by carrying out [ fatty acid ester ] 3-6 mass section content of 3 - 9 mass section and aforementioned high-melting point hydrocarbon system wax for 1 - 6 mass section and aforementioned low melting point hydrocarbon system wax to the aforementioned toner 100 mass section, or given in 2.

[0009] 4. Toner given in any 1 term of the above 1-3 characterized by the sum of content with aforementioned fatty acid ester and high-melting point hydrocarbon system wax being 4 - 10 mass section to the aforementioned toner 100 mass section.

[0010] 5. Toner given in any 1 term of the above 1-4 with which 1-6 mass section content is carried out, and styrene-olefin block copolymer is characterized by bird clapper into the aforementioned binding resin 100 mass section.

[0011] 6. Toner given in any 1 term of the above 1-5 characterized by weight average molecular weight of aforementioned styrene-olefin block copolymer being 5000-500,000.

[0012] 7. In Two Component Developer Which Consists of Binding Resin, Coloring Agent, Toner Containing Waxes, and Carrier at Least The fatty acid ester which has the endothermic peak at which these waxes are measured by DSC in an at least 60-105-degree C field The endothermic peak measured by the low melting point hydrocarbon system wax which has the endothermic peak measured by DSC in an at least 60-105-degree C field, and DSC consists of a high-melting point hydrocarbon system wax in an at least 120-160-degree C field. And the two component developer characterized by this carrier being a silicone resin covering carrier.

[0013] 8. Two component developer given in the above 7 characterized by aforementioned carrier being five to core exposure 30 area %.

[0014] 9. Develop at Least Electrostatic Latent Image Formed on Photo Conductor with Binding Resin, Coloring Agent, and Developer Containing Waxes, and Form Toner Picture on Photo Conductor. In the image formation method established with the fixing equipment which consists of a heating roller which connotes the heating component which this toner picture was imprinted [ heating component ] on the

image formation base material, and had the toner picture on this image formation base material placed in a fixed position, and a pressurization roller by which opposite arrangement was carried out It is the heating roller by which this heating roller was covered by the fluoro-resin with a thickness of 5-300 micrometers and whose surface roughness Ra is 0.1-1.0 micrometers. This pressurization roller was covered with the fluoro-resin with a thickness of 10-500 micrometers. The fatty acid ester which has the endothermic peak at which it is the pressure roll whose surface roughness Ra is 0.2-2.0 micrometers, and these waxes are measured by DSC in an at least 60-105-degree C field By the low melting point hydrocarbon system wax which has the endothermic peak measured by DSC in an at least 60-105-degree C field, and DSC The image formation method characterized by using the toner with which the endothermic peak measured consists of a high-melting point hydrocarbon system wax in an at least 120-160-degree C field.

[0015] Hereafter, this invention is explained in detail.

[Toner] The toner of this invention has the feature in two or more sorts of waxes being included in a binding resin, a styrene-olefin block copolymer, an electric charge control agent, etc. are added according to others, a coloring agent, and the need in a binding resin, a coloring particle is obtained, an external additive is added to this coloring particle, and a toner is obtained. [ waxes / these ] Above-mentioned each material is explained in order below.

[0016] <Waxes> The fatty acid ester (it is henceforth called Wax A) which has the endothermic peak measured by DSC in the toner of this invention in an at least 60-105-degree C field By the low melting point hydrocarbon system wax (it is henceforth called Wax B) which has the endothermic peak measured by DSC in an at least 60-105-degree C field, and DSC Distributed content is carried out minutely and the high-melting point hydrocarbon system wax (it is henceforth called Wax C) which has the endothermic peak measured in an at least 120-160-degree C field forms the wax domain. Since compatibility with a binding resin is high, the above-mentioned wax A can make detailed the above-mentioned wax B with which endothermic peaks differ, and Wax C into a toner, can carry out distributed content uniformly, it can do as a toner and this heat roller at the time of heat roller contact, and can form sufficient liquid membrane quickly with Wax B and Wax C. The high wax C of the above-mentioned endothermic peak can maintain the own mold-release characteristic of a heat roller formed by the fluoro-resin so that it may remain as a protective layer on a heat roller front face and may mention later on it over a long period of time by using together with the low wax A of an endothermic peak, and Wax B.

[0017] Here, if problems, such as weld between toners, occur at the time of preservation and 105 degrees C is exceeded when the endothermic peak of Wax A and Wax B is less than 60 degrees C, the problem that the mold-release characteristic at the time of toner fixing is not securable etc. will be produced. Moreover, if all waxes become only the thing of the low melting point, the preservation stability of a toner is lost and an endothermic peak exceeds 160 degrees C when the endothermic peak of Wax C is less than 120 degrees C, the mold-release characteristic at the time of fixing cannot be secured, but the so-called elevated-temperature offset will occur.

[0018] The waxes of this invention receive the toner 100 mass section. Wax A 1 - 6 mass section, It is desirable to make Wax B contain so that 3-6 mass section content may be carried out and the sum of Wax A and Wax C may serve as 4 - 10 mass section in 3 - 9 mass section and Wax C. the case where the content of the waxes in a toner is under the above-mentioned range -- the effect (offset-proof nature --) of the fixing nature of this invention Heat-resistant roller stain resistance and pasteboard fixing nature will be lost, when exceeding the above-mentioned range, a wax will come to exist too much in a toner, and the endurance of a toner will fall as a result.

[0019] (Measurement of the endothermic peak of the waxes by DSC) The endothermic peak of the waxes measured by DSC shows the value which was measured by the so-called differential scanning calorimetric analysis equipment, and was measured on the following conditions.

[0020] temperature up condition: -- 0-200-degree-C programming-rate: -- 10 degrees C/min -- here, an endothermic peak shows the maximum of the endothermic peak at the time of the 1st heating in addition -- although it is not what is limited especially as a measuring device -- for example, the PerkinElmer,

Inc. make -- DSC-7 etc. can be mentioned

[0021] (Diameter of a wax domain) As for the waxes in the toner of this invention, it is desirable to exist in the state of a domain in a toner, and the diameter of an average wax domain in a toner is 0.3-1 micrometer, and the wax domain of 2 micrometers or more of diameters of a minor axis consists of one-piece less than several% of waxes. The mold-release characteristic itself which waxes give [ the diameter of an average wax domain in the toner of the above-mentioned waxes ] to a toner under in the above-mentioned range will not be demonstrated, but the effect of the fixing nature of the toner of this invention will fall. Moreover, if the diameter of an average wax domain in a toner exceeds the above-mentioned range, the maldistribution of the waxes to the inside of a toner will occur, and it becomes easy to accumulate offset of a minute toner to the fixing nature between toners, and is easy for it to become easy to produce variation and to cause problems, such as contamination of a fixing roller, to it by the use over a long period of time as a result.

[0022] In addition, with the diameter of an average wax domain of this invention, a transmission electron microscope performs cross-section observation, and a toner is measured. Photomacrography of the cross section of the toner which specifically chose at least 20 toners at random, and was chosen is carried out with a transmission electron microscope, and the obtained image is expanded further and it considers as 2000 times, and the diameter of the direction of FERE of the wax domain by which distributed content is carried out is measured with image-analysis equipment (SPICCA:Nippon Avionics Co., Ltd.) to a toner, and the arithmetic mean of the obtained diameter of the direction of FERE is searched for, and let this be the diameter of an average wax domain of the wax in

[0023] Moreover, similarly it asks for the major axis of each wax domain in a toner using Above SPICCA, and the maximum of the path which intersects perpendicularly to the major axis is calculated as a diameter of a minor axis, and the diameter of a minor axis chooses a wax domain 20 micrometers or more, and it asks for number % of pieces to all the wax domains of the selected wax domain.

[0024] (Example of Wax A) Sebacic-acid JIDODESENIRU indicated by carnauba wax, a rice wax, and JP,9-96920,A as an example of Wax A, a lignoceric-acid millimeter still, a behenic acid PENTA ERIS toll, a stearin acid PENTA ERIS toll, etc. can be mentioned.

[0025] (Example of Wax B) As an example of Wax B, paraffin wax, a micro crystalline wax, a natural gas system Fischer Tropsch wax, a coal system Fischer Tropsch wax or the wax obtained by carrying out molecular distillation of those waxes, the low molecular weight polypropylene compounded by the metallocene catalyst, low molecular weight polyethylene, etc. can be mentioned, for example.

[0026] (Example of Wax C) As an example of Wax C, low molecular weight polypropylene can be mentioned, for example, the commercial elegance (Mitsui petrochemical company make) of screw call 770P, screw call 660P, screw call 550P and the commercial elegance (Sanyo Chemical Industries, Ltd. make) of screw call 330P grade, NP505, and NP055 grade can be mentioned.

[0027] <Binding resin> The binding resin used for the toner of this invention is desirable, and a vinyl system polymer is constituted above 70 mass %. You may blend and use resins other than a vinyl system polymer. Polyester resin, a polyether polyol, etc. are used as combination components other than a vinyl system polymer. Moreover, many vinyl system polymers which make a principal component preferably a styrene system monomer and/or (meta) an acrylic-ester system monomer as the above-mentioned vinyl system polymer are used, a low-molecular-weight polymer component and the amount polymer component of macromolecules are contained, and the latus thing of molecular weight distribution is desirable.

[0028] (Range with the suitable molecular weight distribution of binding \*\*\*\*\*) What has [ in the molecular weight distribution measured by GPC of the binding resin used for the toner of this invention ] a peak, respectively in the range of molecular weight 100,000-1,500,000 and molecular weight 3000-50,000 is desirable. Furthermore, it is more desirable to have a peak to the field of molecular weight 200,000-1 million, and to have a peak in the range of molecular weight 3000-8000, respectively. In addition, when molecular weight distribution are expressed with weight average molecular weight/number average molecular weight (Mw/Mn), the range of 11-40 is desirable.

[0029] (Manufacture of a binding resin) Although manufacture of a binding resin is good by any well-



known method, its method by solution polymerization is desirable. Moreover, it is performed that a binding resin combines the fixing intensity of a toner, and a viewpoint to the amount polymer of macromolecules and low-molecular-weight polymer of endurance. The manufacture method of manufacturing this binding resin has the following methods.

[0030] (1) Manufacture separately the amount polymer of macromolecules, and a low-molecular-weight polymer, and blend them dryly.

(2) the inside of the solvent which manufactured separately the amount polymer of macromolecules, and the low-molecular-weight polymer, and heated them -- mixing -- desolventization -- solidify, cool and grind

[0031] (3) the desolventization after supplying the amount polymer of macromolecules to a solvent, mixing and carrying out the polymerization of the low-molecular-weight polymer in this obtained solution -- solidify, cool and grind

[0032] The method of (3) is desirable in the describing [ above ] polymerization method from a viewpoint which exposes waxes on a toner front face. As for the content ratio of a low-molecular-weight polymer component and the amount polymer component of macromolecules, 10:90-40:60 are desirable, and 15:85-25:75 are especially desirable.

[0033] (Monomer of a binding resin) As a monomer for forming the vinyl system resin preferably used as a binding resin For example, styrene, o-methyl styrene, m-methyl styrene, p-methyl styrene, An alpha methyl styrene, p-chloro styrene, 3, 4-dichloro styrene, p-phenyl styrene, p-ethyl styrene, 2, 4-dimethyl styrene, p-t-butyl styrene, p-n-hexyl styrene, p-n-octyl styrene, The styrene or the styrene derivative like p-n-nonyl styrene, p-n-desyl styrene, and p-n-dodecyl styrene, A methyl methacrylate, an ethyl methacrylate, methacrylic-acid n-butyl, A methacrylic-acid isopropyl, a methacrylic-acid isobutyl, methacrylic-acid t-butyl, A methacrylic-acid n-octyl, methacrylic-acid 2-ethylhexyl, stearyl methacrylate, Methacrylic-acid lauryl, a methacrylic-acid phenyl, a methacrylic-acid diethylaminoethyl, Methacrylic-ester derivatives, such as dimethylaminoethyl methacrylate, A methyl acrylate, an ethyl acrylate, an acrylic-acid isopropyl, acrylic-acid n-butyl, Acrylic-acid t-butyl, isobutyl acrylate, an acrylic-acid n-octyl, Acrylic-acid 2-ethylhexyl, acrylic-acid stearyl, acrylic-acid lauryl, it is mentioned as a monomer from which acrylic-ester derivatives, such as an acrylic-acid phenyl, acrylic-acid dimethylaminoethyl, and an acrylic-acid diethylaminoethyl, etc. constitute a resin concretely, and these are independent -- or it can be combined and used

[0034] <Styrene-olefin block copolymer> A styrene-olefin block copolymer can \*\*\*\* distribution of the waxes to the inside of a toner further. For example, the method of adding the styrene-olefin block copolymer (A being a styrene component and B being an olefin component here) expressed with the following structure expression to a binding resin is used preferably.

[0035] structure-expression: -- the molecular weight distribution of A-B, AB-bus available, or the AB\*\*bus available above-mentioned block copolymer -- desirable -- weight average molecular weight -- 5000-500,000 -- it is 20,000-200,000 preferably and is 50,000-100,000 still more preferably It becomes impossible that become easy to dissolve with waxes when too little [ this weight average molecular weight ], it becomes impossible that it is hard to improve distribution of waxes, and it is hard to improve distribution of waxes since the viscosity at the time of melting becomes high when this weight average molecular weight is too large.

[0036] Moreover, the addition to the binding resin of a styrene-olefin block copolymer has desirable 1 - 6 mass %. When too little [ the addition to the binding resin of the above-mentioned styrene-olefin block copolymer ], it becomes that it can be hard to raise the dispersibility of the waxes to the inside of a toner, and when excessive, fixing nature (adhesive property to image formation base materials, such as paper) may fall.

[0037] <Coloring agent> An inorganic pigment and an organic pigment can be mentioned as a coloring agent contained in the toner of this invention. As an inorganic pigment, a well-known thing can be used conventionally, there is especially no limit and magnetic powder, such as carbon black, such as furnace black, channel black, acetylene black, thermal black, and lamp black, and also a magnetite, and a ferrite, is also used as a black pigment, for example. These inorganic pigments can carry out the selection

combined use of independent or the plurality according to a request, and the addition of a pigment is 2 - 20 mass section to a polymer, and 3 - 15 mass section is chosen preferably. As an organic pigment, a well-known thing can be used conventionally, and there is especially no limit. moreover, as a concrete organic pigment for example, as a pigment for a Magenta or red C. I. pigment red 2, C.I. pigment red 3, C.I. pigment red 5, C.I. pigment red 6, C.I. pigment red 7, C.I. pigment red 15, C.I. pigment red 16, and C.I. pigment red 48: 1, C.I. pigment red 53: 1, C.I. pigment red 57: 1, the C.I. pigment red 122, the C.I. pigment red 123, the C.I. pigment red 139, the C.I. pigment red 144, the C.I. pigment red 149, the C.I. pigment red 166, the C.I. pigment red 177, C. I. pigment red 178 and C.I. pigment red 222 grade are mentioned. Moreover, as a pigment for an orange or yellow, the C.I. pigment orange 31, the C.I. pigment orange 43, the C.I. pigment yellow 12, the C.I. pigment yellow 13, the C.I. pigment yellow 14, the C.I. pigment yellow 15, the C.I. pigment yellow 17, the C.I. pigment yellow 93, the C.I. pigment yellow 94, and C.I. pigment yellow 138 Moreover, as a pigment for green or cyanogen, the C.I. pigment blue 15, the C.I. pigment blue 15:2, the C.I. pigment blue 15:3, the C.I. pigment blue 16, the C.I. pigment blue 60, and C.I. pigment green 7 grade are mentioned. According to a request, it is possible independent or for these organic pigments to carry out the selection combined use of the plurality. Moreover, the addition of a pigment is two to 20 mass % to a polymer, and 3 - 15 mass % is chosen preferably.

[0038] <Electric charge control agent> As an internal additive (arbitrary component of a toner) used in order to obtain the toner of this invention, negative electrification nature electric charge control agents, such as an azo system metal complex, a salicylic-acid metal complex, and a calyx allene system compound, are mentioned, and right electrification nature electric charge control agents, such as a Nigrosine color, a quarternary-ammonium-salt system compound, and a triphenylmethane-color compound, are mentioned.

[0039] <External additive> (plasticizer as an external additive) Although a well-known non-subtlety particle and an organic particle can be used conventionally, it is desirable to use a non-subtlety particle from a viewpoint which gives a fluidity to the coloring particle obtained. As a compound which constitutes this non-subtlety particle, various kinds of inorganic oxides, a nitride, a boride, etc. can be mentioned, and a silica, an alumina, a titania, a zirconia, a barium titanate, an aluminum titanate, a strontium titanate, titanate-acid magnesium, a zinc oxide, a chrome oxide, a cerium oxide, an antimony oxide, a tungstic oxide, tin oxide, a tellurium oxide, manganese oxide, boron oxide, silicon carbide, a boron carbide, a titanium carbide, silicon nitride, a titanium nitride, boron nitride, etc. are mentioned as the example. A thing hydrophobic as these inorganic particle is desirable. specifically As a silica particle For example, Japanese Aerosil The commercial elegance R-805 of Make, R-976, R-974, R-972, R-812, R-809, HVK-2150 by Hoechst A.G., H-200, commercial elegance TS-720 by Cabot Corp., TS-530, TS-610, H-5, and MS-5 grade are mentioned. As a titanium particle, for example The commercial elegance T-805 made from Japanese Aerosil, T-604, commercial elegance MT-100S by TAYCA CORP., MT-100B, MT-500BS, MT-600, MT-600SS, JA-1, commercial elegance TA-300SI made from Fuji Titanium, TA-500, TAF-130, TAF-510, TAF-510T, commercial Idemitsu Kosan elegance IT-S, IT-OA, IT-alumnus, IT-OC, etc. are mentioned. As an alumina particle, commercial elegance RFY-C made from Japanese Aerosil, C-604, and the commercial elegance TTO-55 grade by Ishihara Sangyo Kaisha, Ltd. are mentioned, for example. Moreover, as an organic particle, the diameter of a number-average primary particle can use the organic globular form particle which is about 10-2000nm. As this thing, homopolymers and these copolymers, such as styrene and methyl methacrylate, can be used.

[0040] (Lubricant as an external additive) As lubricant, the metal salt of higher fatty acids, such as salts, such as salts, such as salts, such as salts, such as salts, such as zinc of stearin acid, aluminum, copper, magnesium, and calcium, zinc of oleic acid, manganese, iron, copper, and magnesium, zinc of a palmitic acid, copper, magnesium, and calcium, zinc of linolic acid, and calcium, zinc of a ricinoleic acid, and calcium, is mentioned, for example. The addition of these external additives has a desirable 0.1 - 5 mass % grade to a toner.

[0041] <Measurement of each weighted solidity of a toner> (measurement of the glass transition point (Tg) of a toner) Since it is compatible in 50-70 degrees C, shelf life, and pasteboard fixing nature, Tg of

a toner has especially desirable 52-56 degrees C. Moreover, the glass transition point of a toner is the value measured in DSC, and let the intersection of the base line and the inclination of an endothermic peak be a glass transition point. Specifically, using a differential scanning calorimeter, after leaving it for 3 minutes to 100 degrees C at the temperature of temperature up *Perilla frutescens* (L.) Britton var. *crispa* (Thunb.) Decne., it cools to a room temperature by part for descent temperature/of 10 degrees C. Subsequently, when this sample is measured by part for 10 degrees-C/of programming rates, the intersection of the extension wire of the base line below Tg and the tangent which shows the maximum inclination of a before [ from the standup portion of a peak / the peak of a peak ] is shown as Tg.

[0042] As a measuring device, the DSC-7 grade by PerkinElmer, Inc. can be used.

[0043] <Measurement of the molecular weight of the binding resin of a toner> The molecular weight distribution of a binding resin show the styrene conversion molecular weight measured in GPC. The measuring method of molecular weight, such as weight average molecular weight (Mw) of the binding resin by GPC and number average molecular weight (Mn), is measurement by GPC (gel permeation chromatography) which used the tetrahydro furan (THF) as the solvent, 0.5-5mg of measurement samples, it specifically adds 1ml of THF(s) to 1mg, stirs using a magnetic stirrer etc. at a room temperature, and is fully dissolved. Subsequently, after processing with a membrane filter with a pore size of 0.45-0.50 micrometers, it pours in to GPC. The measurement conditions of GPC stabilize a column at 40 degrees C, pass THF by the rate of flow 1ml/m, and about 100ml of samples with a concentration of 1mg [ /ml ] is poured in, and they measure them. As for a column, it is desirable to use it combining a commercial polystyrene gel column. For example, Shodex by Showa Denko K.K. GPC KF-801, combination of 802, 803, 804, 805, 806, and 807 and TSK by TOSOH CORP. gelG1000H, G2000H, G3000H, G4000H, G5000H, G6000H, G7000H, TSK guard The combination of column etc. can be mentioned. Moreover, as a detector, it is good to use a refractive-index detector (IR detector) or the UV detector. In the determination of molecular weight of a sample, it computes using the calibration curve which produced the molecular weight distribution which a sample has using the mono dispersion polystyrene standard particle. It is good to use about ten points as polystyrene for calibration-curve production.

[0044] (Measurement of the volume mean particle diameter of a toner) The volume mean particle diameter of a toner can be measured using Coulter-counter TA-II, a coal tar multi-sizer, SLAD1100 (Shimadzu laser diffraction formula particle-size measuring device), etc. In Coulter-counter TA-II and a coal tar multi-sizer, it is measured using the particle size distribution in the range of 2.0-40 micrometers using a diameter =of aperture100micrometer aperture.

[0045] The <manufacture method of a toner> It is not limited especially as a method of manufacturing the toner of this invention. However, since a suitable distributed state can be acquired by making at least one sort of waxes exist, and carrying out a polymerization in the stage which compounds a binding resin by the polymerization method in order to distribute waxes effectively and to consider as a suitable distributed state, it is desirable. That is, by this invention, in order to use together at least three sorts of waxes, there is an inclination for distribution of waxes to become unstable, by the usual technique of mixing each of these waxes at the time of kneading. As this reason, although it is not clear, it guesses because a melt viscosity difference is among three sorts of waxes. Although a vinyl system monomer, at least one sort of waxes, a polymerization initiator, and a solvent are mixed and being considered as a uniform solution as an example of a polymerization method, a resin besides in this case, a styrene-olefin block copolymer, etc. may be added, the heating polymerization of the obtained solution is carried out, and a binding resin is obtained. Subsequently, to the obtained binding resin, an electric charge control agent is added according to a coloring agent, other waxes, and the need, it heats, kneads, cools, grinds and classifies, a coloring particle is obtained, an external additive is added to the obtained coloring particle, and the toner of this invention is obtained. The waxes containing the wax added at the time of at least one sort of waxes added at the time of the polymerization of the above-mentioned binding resin and toner kneading contain Wax A, Wax B, and Wax C at least, as the term of the aforementioned toner explained. When one kind of wax contains in toner manufacture of this invention at the time of the polymerization of the above-mentioned binding resin, at the time of toner kneading, two kinds of other

waxes contain at least. When at least one kind of wax contains at the time of toner kneading when two kinds of other waxes contain at the time of the polymerization of the above-mentioned binding resin, and three kinds of waxes contain at the time of the polymerization of the above-mentioned binding resin, a wax does not need to contain at the time of toner kneading.

[0046] In the manufacture method of the above-mentioned toner, the crusher of an air current formula like lab jet (Japanese pneumatic company make) and a mechanical crusher like a turbo mill (turbo industrial company make) are known as a well-known crusher used for the trituration method of a process of performing kneading, cooling, and trituration. In this invention, the thing with the high effect of exposing the wax to contain on a toner front face which a mechanical crusher grinds is desirable.

[0047] [Two component developer] It mixes and the two component developer of this invention is obtained so that toner concentration may become 1 - 10 mass % about the above-mentioned toner and the carrier mentioned later.

[0048] <Carrier> As a core material particle which constitutes the resin covering carrier of a two component developer used for this invention, iron powder, a magnetite, various ferrites, etc. can be mentioned and a magnetite and a ferrite are [ among these ] desirable.

[0049] It is desirable to use the light metal ferrite which contains the ferrite, alkali metal (for example, Li, Na), and/or alkaline earth metal (for example, Mg, calcium, Sr, Ba) containing metals, such as copper, zinc, nickel, and manganese, as a ferrite here. From a viewpoint of the improvement in the speed of equipment in this invention, magnetization is comparatively high, and since resistance is proper, especially the thing for which the manganese ferrite shown with the following structure expression is used is desirable.

[0050] Structure expression: (MnO) It is  $0 < X < 1$  among  $x(\text{Fe}_2\text{O}_3)_{1-x}$  formula.

[0051] As a resin which constitutes a resin covering carrier, silicone resin is used, and since this silicone resin is excellent in adhesion with a core material and does not pollute a toner front face with a covering resin or its secession object, it can prevent the hot-calender-roll contamination by the toner.

[0052] In order to suppress secession of a covering resin, the silicone resin covering carrier whose core exposure is five to 30 area % is used preferably. A core exposure measures the element of area which serves as a principal component in a core (carrier core material), for example, the rate which iron occupies, by ESCA, and measures the rate of occupancy area of this element (for example, iron) in a resin covering carrier front face, and computes the surface exposure of a core by the following formula.

[0053] (Core exposure) = (rate of occupancy area of iron in carrier front face) / (rate of occupancy area of iron in core front face)  $\times 100$  (%)

Here, especially as silicone resin, although not limited, the condensation reaction type silicone resin hardened at a heating dehydration condensation reaction, a room temperature moisture hardening reaction, etc. is used preferably.

[0054] The [image formation method] By the image formation method of this invention, the feature is in the heating roller and pressurization roller for the toner image formed by the electrophotography method being established, and acquiring a fixing picture.

[0055] <A heat roller and pressurization roller> The toner of this invention is covered with a fluoro resin with a thickness of 5-300 micrometers, and it is covered with the heating roller whose surface roughness  $R_a$  is 0.1-1.0 micrometers, and a fluoro resin with a thickness of 10-500 micrometers, and under pinching with the pressure roll whose surface roughness  $R_a$  is 0.2-2.0 micrometers, heating conveyance is carried out and it is fixed to it.

[0056] Moreover, the heating roller with which application processing was carried out or the polyperfluoro alkyl ether resin was covered with the tube made from polyperfluoro alkyl ether, for example on rodding as an example of the above-mentioned heating roller by 10-30 micrometers in thickness and whose surface roughness  $R_a$  is 0.2-0.5 micrometers is desirable. Moreover, as an example of the above-mentioned pressurization roller, cover polyperfluoro alkyl ether in the rubber layer formed by HTV and RTV, for example on rodding, 50-140 micrometers is made to cover preferably the tube made from application processing or polyperfluoro alkyl ether, and the pressurization roller whose surface roughness  $R_a$  a rubber degree of hardness is 0.3-0.8 micrometers in JIS-K6301 ASUKA C scale

weighting is desirable at 60 - 75 degrees. If the aforementioned heating roller and a pressurization roller are combined, the fixing performance which divided and was excellent is demonstrated, and even if it does not have the cleaning mechanism in which a heating roller is cleaned, the fixing equipment stabilized over the long time will be obtained.

[0057] As a fluororesin used for the above-mentioned heating roller and a pressurization roller, PTFE (poly tetrafluoroethylene), PFE (tetrafluoroethylene-perfluoro alkyl vinyl ether copolymer), etc. can be illustrated. Especially this better \*\* is PFA (it is a tetrafluoroethylene-perfluoro ethylene vinyl ether copolymer.).

[0058]

[Example] Hereafter, although an example explains this invention concretely, this invention is not limited to this.

[0059] <Manufacture of a wax> Molecular distillation of the Fischer Tropsch wax "FT-100" (shell MDR company make) was carried out as an example of the low melting point hydrocarbon system wax B, and the wax b1 of 89 degrees C of melting points (penetration 3) and the wax b2 of 102 degrees C of melting points (penetration 1) were obtained. Furthermore, molecular distillation of Fischer Tropsch wax FT-70 (shell MDR company make) was carried out, and the wax b3 of 70 degrees C of melting points (penetration 5) was obtained.

[0060] <Manufacture of a binding resin> (example of manufacture of the binding resin A) Toluene 600g is put into a 3l. separable flask, and it is 250g of styrene-n-butyl acrylate-methyl methacrylate copolymers of weight average molecular weight 1,200,000, and a styrene-olefin block copolymer. Fischer Tropsch wax "C-77" (SAZORU public corporation make) 75g (per toner 100 mass section 4.4 mass sections) of \*\* styrene / hydrogenation isoprene / 24g (Mw= 70,000) (per binding resin 100 mass section 1.9 mass section) of styrene block copolymers of 3 yuan, and 77 degrees C of melting points was supplied, and it dissolved. After nitrogen gas replaced a gaseous layer, it warmed, and solution polymerization was performed while the mixture which dissolved azobisisobutyronitril 80g as styrene 760g, methyl methacrylate 180g, n-butyl acrylate 60g, and a polymerization initiator while stirring, after the rotary flow of toluene had occurred was dropped over 2.5 hours. Carrying out the temperature up of the oil bath temperature to 160 degrees C, after riping after a dropping end for 30 minutes, stirring at the rotary flow temperature of toluene further, it ground after cooling through the desolventization process for removing toluene under reduced pressure, and the binding resin A for the toners of this invention was obtained.

[0061] (Example of manufacture of the binding resin B) Except having used the wax b3 instead of the Fischer Tropsch wax "C-77" in manufacture of the binding resin A, the binding resin B was manufactured similarly.

[0062] (Example of manufacture of the binding resin C) Except having used the wax b1 instead of the Fischer Tropsch wax "C-77" in manufacture of the binding resin A, the binding resin C was manufactured similarly.

[0063] (Example of manufacture of the binding resin D) The binding resin D was similarly manufactured except having used the tetrapod behenic acid PENTA ERIS toll (82 degrees C of melting points) instead of the Fischer Tropsch wax "C-77" in manufacture of the binding resin A, and having carried out 12g (per binding resin 100 mass section 1.0 mass section) use of styrene / hydrogenation isoprene / the styrene block copolymer of 3 yuan.

[0064] (Example of manufacture of the binding resin E) Except not using styrene / hydrogenation isoprene / styrene block copolymer of 3 yuan in manufacture of the binding resin A, the binding resin E was manufactured similarly.

[0065] (Example of manufacture of the binding resin F) Except having used the wax b2 instead of the Fischer Tropsch wax "C-77" in manufacture of the binding resin A, the binding resin F was manufactured similarly.

[0066] (Example of manufacture of the binding resin G) Except having set the Fischer Tropsch wax "C-77" to 24g (per toner 100 mass section 1.6 mass section) in manufacture of the binding resin A, the binding resin G was manufactured similarly.

[0067] (Example of manufacture of the binding resin H) Except having set the Fischer Tropsch wax "C-77" to 120g (per toner 100 mass section 7.6 mass sections) in manufacture of the binding resin A, the binding resin H was manufactured similarly.

[0068]

<Example of toner manufacture> (toner 1 of this invention)

Binding resin A . The 100 mass sections Carbon black 12 mass sections Metal complex of a monoazo color 1 mass section Carnauba wax (83 degrees C of melting points) 2 mass sections Polypropylene wax "screw call 660P"

(3 \*\* Chemicals company make) (145 degrees C of melting points) 4 mass sections, however the above-mentioned carnauba wax 2 mass section are the 1.7 mass sections per toner 100 mass section, and the "screw call 660P" 4 mass section is the 3.3 mass sections per toner 100 mass section.

[0069] After mixing the above-mentioned material in a Henschel mixer, melting kneading was carried out with the biaxial kneading extruder set as 110 degrees C. After cooling the obtained kneading object and carrying out coarse grinding with a hammer mill, it pulverized using the air current formula grinder equipped with the rotor, and classified with the pneumatic elutriation machine, and the coloring particle A of 9.5 micrometers of volume mean particle diameters was obtained. Further Coloring particle A The 100 mass sections Hydrophobic silica particle The 0.6 mass sections above-mentioned material was mixed for 15 minutes at the rotational frequency which serves as peripheral speed of 24m/second of a stirring spring using a Henschel mixer, and the toner 1 was obtained.

[0070] (Toner 2 of this invention) In the toner 1, the toner 2 was similarly obtained except having made carnauba wax into the tetrapod stearin acid PENTA ERIS toll (77 degrees C of melting points) for the binding resin A at the binding resin B.

[0071] (Toner 3 of this invention) In the toner 1, the toner 3 was similarly obtained except having made carnauba wax into the tetrapod behenic acid PENTA ERIS toll (82 degrees C of melting points) for the binding resin A at the binding resin C.

[0072] (Toner 4 of this invention) In the toner 1, the toner 4 was similarly obtained except having used carnauba wax as the polyethylene wax (72 degrees C of melting points) for the binding resin A at the binding resin D.

[0073] (Toner 5 of this invention) In the toner 1, the toner 5 was similarly obtained except having used the binding resin A as the binding resin E.

[0074] (Toner 6 of this invention) In the toner 1, the toner 6 was similarly obtained except having made carnauba wax into 1-4 butane distearyl (65 degrees C of melting points) for the binding resin A at the binding resin F.

[0075] (Toner 7 of this invention) In the toner 1, the toner 7 was similarly obtained except having made the binding resin A as the binding resin G, and having made carnauba wax into the 0.4 mass section.

[0076] However, the above-mentioned carnauba wax 0.4 mass section is the 0.3 mass section per toner 100 mass section.

[0077] (Toner 8 of this invention) In the toner 1, the toner 8 was similarly obtained except having made the binding resin A as the binding resin H, and having made carnauba wax into 7 mass sections.

[0078] However, the above-mentioned carnauba wax 7 mass section is the 5.9 mass sections per toner 100 mass section.

[0079]

(Toner 1 for comparison)

Styrene-n-butyl acrylate copolymer (Mw:111,000, Mn:4,000, Mw/Mn:26)

The 100 mass sections Carbon black 10 mass sections Fischer Tropsch wax "H1-N6"

(SAZORU public corporation make) (98 degrees C of melting points) 2 mass sections Polypropylene wax "screw call 660P" (145 degrees C of melting points)

5 mass sections Metal complex of a monoazo color The toner 1 for comparison as well as a toner 1 was obtained except having considered as 1 mass section.

[0080] However, the above-mentioned Fischer Tropsch wax "H1-N6" 2 mass section is the 1.7 mass section per toner 100 mass section, and the above-mentioned "screw call 660P" 5 mass section is the 4.2



mass sections per toner 100 mass section. \*\*.

[0081]

(Toner 2 for comparison)

Styrene-n-butyl acrylate copolymer (Mw:111,000, Mn:4,000, Mw/Mn:26)

The 100 mass sections Carbon black 6 mass sections Polyethylene wax (76 degrees C of melting points) 2 mass sections Polyethylene wax (127 degrees C of melting points) 2 mass sections Metal complex of a monoazo color Make it be the same as that of a toner 1 except having considered as 1 mass section. The toner 2 for comparison was obtained.

[0082] However, the polyethylene wax (76 degrees C of melting points) and polyethylene wax (127 degrees C of melting points) 2 mass section is the 1.8 mass section per toner 100 mass section.

[0083]

(Toner 3 for comparison)

Styrene-n-butyl acrylate copolymer (Mw:111,000, Mn:4,000, Mw/Mn:26)

The 100 mass sections Carbon black 6 mass sections Distearyl ketone (87.5 degrees C of melting points) 5 mass sections Polypropylene wax "screw call 660P" (145 degrees C of melting points) 3 mass sections Metal complex of a monoazo color The toner 3 for comparison as well as a toner 1 was obtained except having considered as 1 mass section.

[0084] However, the above-mentioned distearyl ketone 5 mass section is the 4.4 mass sections per toner 100 mass section, and the above-mentioned "screw call 660P" 3 mass section is the 2.5 mass sections per toner 100 mass section.

[0085] The content (mass section) in melting point [ of the fatty-acid-ester system wax A of each toner obtained as mentioned above, the low melting point hydrocarbon system wax B, and the high-melting point hydrocarbon system wax C ] (Mp) \*\* and a toner and the addition stage (at the time of toner kneading or the polymerization of a binding resin) were shown in Table 1 and 2. Moreover, the addition (mass section) of the styrene-olefin block copolymer for the diameter control of a wax domain of HE in a binding resin was shown in Table 1.

[0086]

[Table 1]

トナーNo. (結着樹脂名)	添加時期として結着樹脂の重合時に添加される ワックス類及びブロック共重合体	
	低融点炭化水素ワックス B 又は 脂肪酸エステル系ワックス A のトナー 100 質量部に対する添加量、質量部及び融点 (Mp)	ブロック共重合体の結着樹脂 100 質量部 に対する添加量、質量部及び重量平均分子量 (Mw)
本発明 トナー1(A)	ワックス「C-77」 4.4(77℃)	スチレン/水添イソブレン/スチレン 1.9(7万)
本発明 トナー2(B)	ワックス C 4.4(70℃)	スチレン/水添イソブレン/スチレン 1.9(7万)
本発明 トナー3(C)	ワックス「C-77」 4.4(89℃)	スチレン/水添イソブレン/スチレン 1.9(7万)
本発明 トナー4(D)	テトラベヘン酸ペンタエリストール 4.4(82℃)	スチレン/水添イソブレン/スチレン 1.0(7万)
本発明 トナー5(E)	ワックス「C-77」 4.4(77℃)	スチレン/水添イソブレン/スチレン 1.0(7万)
本発明 トナー6(F)	ワックス b 4.4(102℃)	スチレン/水添イソブレン/スチレン 1.9(7万)
本発明 トナー7(G)	ワックス「C-77」 1.6(77℃)	スチレン/水添イソブレン/スチレン 1.9(7万)
本発明 トナー8(H)	ワックス「C-77」 7.6(77℃)	スチレン/水添イソブレン/スチレン 1.9(7万)
比較 トナー1	—	—
比較 トナー2	—	—
比較 トナー3	—	—

[0087]

[Table 2]

トナーNo. (結着樹脂名)	添加時期としてトナーの混練時に添加されるワックス類	
	高融点炭化水素系ワックス C のトナー 100 質量部に対する添加量、質量部及び融点 (Mp)	脂肪酸エステル系ワックス A 又は低沸点炭化 水素系ワックス B のトナー100 質量部に対する 添加量、質量部及び融点(Mp)
本発明 トナー1(A)	ビスコール 660P 3.3(145°C)	カルナウバワックス 1.7(83°C)
本発明 トナー2(B)	ビスコール 660P 3.3(145°C)	テトラステアリン酸ペンタエリストール 1.7(77°C)
本発明 トナー3(C)	ビスコール 660P 3.3(145°C)	テトラベヘン酸ペンタエリストール 1.7(82°C)
本発明 トナー4(D)	ビスコール 660P 3.3(145°C)	ポリエチレンワックス 1.7(72°C)
本発明 トナー5(E)	ビスコール 660P 3.3(145°C)	カルナウバワックス 1.7(83°C)
本発明 トナー6(F)	ビスコール 660P 3.3(145°C)	1,4-ブタンジステアリル 1.7(65°C)
本発明 トナー7(G)	ビスコール 660P 3.3(145°C)	カルナウバワックス 0.3(83°C)
本発明 トナー8(H)	ビスコール 660P 3.3(145°C)	カルナウバワックス 5.9(83°C)
比較 トナー1	ビスコール 660P 4.2(145°C)	フィッシュヤートロブシュワックス「H1-N6」 1.7(98°C)
比較 トナー2	ポリエチレンワックス 1.8(127°C)	ポリエチレンワックス 1.8(76°C)
比較 トナー3	ビスコール 660P 2.6(145°C)	ジステアリルケトン 4.4(87.5°C)

[0088] <Example of carrier manufacture> Let the manganese ferrite particle of 80 micrometers of volume mean particle diameters be a carrier core material. Did 8 mass % mixture of N-phenyl-gamma-aminopropyl methyl trimetoxysilane, and it was made to dissolve in toluene to the solid content of silicone resin "tradename SR-2411 and solid-content concentration 20 mass %" (Dow Corning Toray Silicone make), 0.5 mass % coating of was done to the carrier core material using fluid bed coating equipment, after calcinating for 2 hours and cooling at 200 more degrees C, it processed for 10 minutes by the vibration mill, and the carrier 1 of core exposure 8 area % was obtained.

[0089] <Manufacture of a developer> The toners 1-8 and the toners 1-3 for comparison of this invention were mixed so that it might become a carrier 1 and toner concentration 4 mass %, and 11 kinds of developers (the developers 1-8 and the comparison developers 1-3 of this invention) were prepared.

[0090] Moreover, number% of pieces of the wax domain of the diameter of an average wax domain of the waxes (a fatty-acid-ester system wax, a low melting point hydrocarbon system wax, and high-melting point hydrocarbon system wax) in the toners 1-8 and the toners 1-3 for comparison of this invention and 2 micrometers or more of diameters of a minor axis was measured, and the result was shown in Table 3. In addition, measurement of number% of pieces of the wax domain of the diameter of an average wax domain of the above-mentioned waxes and 2 micrometers or more of diameters of a minor axis is as follows.

[0091] 30 toner particles are chosen at random and the selected toner is judged with a microtome. The intercept with a thickness of about 0.2 micrometers was produced, the negative scale-factor:280 time photograph was taken, the transmission electron microscope extended this intercept, the 2000 times as many photograph as this was produced, this was asked for the diameter of a number average of a wax domain as a diameter of an average wax domain with image-analysis equipment (SPICCA), and number % of pieces was further computed from the number of the domains of 2 micrometers or more of diameters of a minor axis to the number of all wax domains.

[0092] <Evaluation> The Konica digital copier 7060 (contact development method) was converted, and on-the-spot photo evaluation was carried out. Conditions are conditions shown below. The laminating



type organic photo conductor was used as a photo conductor.

[0093] Photo conductor surface potential = -700VDC bias = -500VDsd = 600-micrometer developer layer regulation = magnetism H-Cut method developer thickness The diameter of = 700-micrometer development sleeve = it is fixing equipment 40mm again. Iron was used as \*\* and rodding, the heating roller whose surface roughness Ra covered with PFA (tetrafluoroethylene-perfluoroalkylvinyl ether copolymer) with a thickness of 25 micrometers in the front face is 0.8 micrometers was used, iron rodding was used as a pressurization roller, and surface roughness Ra which covered the PFA tube with a thickness of 120 micrometers on HTV silicone rubber used the pressurization roller which is 0.8 micrometers. In addition, nip width of face is 5.8mm, and linear velocity is 420 mm/sec.

[0094] In addition, the cleaning mechanism and silicone oil feeder style of fixing equipment have not equipped. The temperature of fixing was controlled by the skin temperature of a heating roller, and was made into the setting temperature of 195 degrees C.

[0095] Moreover, as a transfer paper to be used, the pasteboard of paper-of-fine-quality 200 g/m<sup>2</sup> was used, and the with an parallel to paper travelling direction (heat roller hoop direction) length [ width of face of 0.3-1.0mm and a length of 150mm ] line drawing image was formed. Moreover, as image formation conditions, continuous image formation of 10,000 sheets was carried out in the ordinary temperature normal-relative-humidity environment (25 degrees C / 55%RH). The pasteboard fixing nature of 10,000 sheets after (%) extracted the 1 inch angle solid picture of toner coating weight 0.6 mg/cm<sup>2</sup>, exfoliated with the Scotch whisky mending tape (Sumitomo 3 M company make), searched for this picture from the picture concentration before and behind ablation (ratio [ of the picture concentration after the ablation to the picture concentration before ablation ] %), and showed the result in Table 3. Moreover, viewing estimated the degree of the dirt of the heat roller for fixing when copying to 1 million sheets, and the result was shown in Table 3.

[0096]

[Table 3]

トナー No.	ローラー 汚染	厚紙 定着性 (%)	トナー中のワックスドメインの特性	
			平均ワックス ドメイン径 ( $\mu$ m)	短軸径 2 $\mu$ m 以上の ワックスドメインの個数 (%)
本発明トナー1	100 万枚迄未発生	99	0.45	0.2
本発明トナー2	80 万枚迄未発生	98	0.80	0.4
本発明トナー3	100 万枚迄未発生	96	0.65	0.8
本発明トナー4	100 万枚迄未発生	98	0.51	0.4
本発明トナー5	50 万枚迄未発生	92	0.84	0.7
本発明トナー6	50 万枚迄未発生	93	0.98	0.9
本発明トナー7	50 万枚迄未発生	90	0.96	0.8
本発明トナー8	50 万枚迄未発生	91	0.97	0.8
比較トナー1	1000 枚で発生	58	1.62	24
比較トナー2	1000 枚で発生	66	1.58	22
比較トナー3	1500 枚で発生	62	1.34	13

[0097] From Table 3, as for the toner of this invention, the fatty-acid-ester system wax A as waxes, the low melting point hydrocarbon system wax B, and the high-melting point hydrocarbon system wax C form a uniform and detailed wax domain. Although fixing nature is excellent even when distributed content is carried out, and contamination of a heat roller is not produced in process of the image formation over a long period of time and pasteboard is used, it turns out that the dispersibility in the toner of a wax is bad, contamination of a heat roller is produced in process of the image formation over a long period of time, and pasteboard fixing nature is bad, and a comparative toner is lacking in practicality.

[0098]

[Effect of the Invention] As the example proved, according to the toner, two component developer, and the image formation method of this invention, also in the pasteboard with which a fixing load cannot be transmitted easily, fixing nature is excellent, and it has the outstanding effect -- in equipment without a heat roller cleaning system, heat roller contamination does not occur at the time of long-term use.

.....  
[Translation done.]